

Spinal Cord Injury Fact Sheet

CIRM funds many projects seeking to better understand spinal cord injury and to translate those discoveries into new therapies.

Description

About 250,000 people in the U.S. live with spinal cord injuries. Half of those are quadriplegic, with the paralysis impacting all four limbs to some extent. For those individuals the lifetime cost of managing their condition is estimated to be between \$2 million and \$3 million.

Spinal cord injury became the first condition targeted in a human clinical trial using cells made from embryonic stem cells. That trial, begun by Geron in 2010 and based on the findings of a team CIRM currently funds, was later cancelled by Geron for financial reasons. By the time of the cancellation five patients around the country had been enrolled in the study, including two at Stanford, who entered the trial during a period when CIRM funded Geron. Those patients continue to be followed to learn as much as possible about this approach.

California's stem cell agency retains many grants for research to move potential spinal cord injury therapies forward (the full list is below). Much of this work focuses on trying to determine which type of nerve cell is the best one to transplant, and deciding which type of stem cell is the best starting point for making those cells. Other research is trying to see if these transplanted cells become part of the existing nerve system, helping create new pathways that can transmit nerve signals to muscles. The researchers are also looking at ways to try and improve the ability of these transplanted cells to become part of the nerve system.

One obstacle that some teams are trying to overcome is the tendency of the scar at the site of injury to block the growth of these transplanted cells. One group is trying to overcome that by combining stem cells with synthetic scaffolds that can be placed at the site of injury, to help the cells bridge the scar and restore signals. In animal models this combination has resulted in an increase in mobility compared to stem cell grafts alone.

Clinical Stage Programs

Asterias Biotherapeutics

The company uses cells derived from embryonic stem cells to heal the spinal cord at the site of injury. They mature the stem cells into cells called oligodendrocyte precursor cells that are injected at the site of injury where it is hoped they can repair the insulating layer, called myelin, that normally protects the nerves in the spinal cord.

- [Read a summary of this project](#)








Progress and Promise toward a stem cell-based therapy for spinal cord injury

CIRM Grants Targeting Spinal Cord Injury

Researcher name	Institution	Grant Title	Grant Type	Approved funds	
Jane Lebkowski	Geron Corporation	Evaluation of Safety and Preliminary Efficacy of Escalating Doses of GRNOPC1 in Subacute Spinal Cord Injury	Targeted Clinical Development	\$6,405,771	
Arnold Kriegstein	University of California, San Francisco	Human ES cell-derived MGE inhibitory interneuron transplantation for spinal cord injury	Early Translational III	\$1,623,251	
Mark Tuszynski	University of California, San Diego	Functional Neural Relay Formation by Human Neural Stem Cell Grafting in Spinal Cord Injury	Early Translational III	\$4,600,447	
Eric Ahrens	University of California, San Diego	Molecular Imaging for Stem Cell Science and Clinical Application	Research Leadership	\$5,920,899	
Samantha Butler	University of California, Los Angeles	Assessing the mechanism by which the Bone Morphogenetic Proteins direct stem cell fate	Basic Biology V	\$515,730	
Jane Lebkowski	Asterias Biotherapeutics	A Phase I/IIa Dose Escalation Safety Study of AST-OPC1 in Patients with Cervical Sensorimotor Complete Spinal Cord Injury	Strategic Partnership III Track A	\$14,323,318	
Catriona Jamieson	University of California, San Diego	Alpha Stem Cell Clinic for the Development of Regenerative Therapies	Alpha Stem Cell Clinics	\$7,999,137	
Sarah Heilshorn	Stanford University	Injectable Hydrogels for the Delivery, Maturation, and Engraftment of Clinically Relevant Numbers of Human Induced Pluripotent Stem Cell-Derived Neural Progenitors to the Central Nervous System	Tools and Technologies III	\$1,347,767	
Bennett Novitch	University of California, Los Angeles	Molecular Characterization of hESC and hiPSC-Derived Spinal Motor Neurons	Basic Biology I	\$1,229,922	
Leif Havton	University of California, Irvine	Repair of Conus Medullaris/Cauda Equina Injury using Human ES Cell-Derived Motor Neurons	Early Translational II	\$75,628	
Aileen Anderson	University of California, Irvine	Role of the microenvironment in human iPS and NSC fate and tumorigenesis	Basic Biology II	\$1,256,194	

Leif Havton	University of California, Los Angeles	Development of a Relevant Pre-Clinical Animal Model as a Tool to Evaluate Human Stem Cell-Derived Replacement Therapies for Motor Neuron Injuries and Degenerative Diseases	Tools and Technologies III	\$1,308,711	
leif Havton	University of California, Irvine	Repair of Conus Medullaris/Cauda Equina Injury using Human ES Cell-Derived Motor Neurons	Early Translational II	\$1,527,011	
David Schaffer	University of California, Berkeley	Scalable, Defined Production of Oligodendrocyte Precursor Cells to Treat Neural Disease and Injury	Quest - Discovery Stage Research Projects	\$1,634,055	
Binhai Zheng	University of California, San Diego	Genetic manipulation of human embryonic stem cells and its application in studying CNS development and repair	SEED Grant	\$600,441	
Mark Tuszynski	University of California, San Diego	Neural Stem Cell Relays for Severe Spinal Cord Injury	Quest - Discovery Stage Research Projects	\$1,905,173	
Brian Cummings	University of California, Irvine	The Immunological Niche: Effect of immunosuppressant drugs on stem cell proliferation, gene expression, and differentiation in a model of spinal cord injury.	SEED Grant	\$595,345	
Aileen Anderson	University of California, Irvine	Generation and in vitro profiling of neural stem cell lines to predict in vivo efficacy for chronic cervical spinal cord injury.	Quest - Discovery Stage Research Projects	\$1,575,613	
Ziwei Huang	Sanford-Burnham Medical Research Institute	New Chemokine-Derived Therapeutics Targeting Stem Cell Migration	SEED Grant	\$708,000	
Hans Keirstead	University of California, Irvine	hESC-Derived Motor Neurons For the Treatment of Cervical Spinal Cord Injury	Comprehensive Grant	\$2,158,445	
Martin Marsala	University of California, San Diego	Spinal ischemic paraplegia: modulation by human embryonic stem cell implant.	Comprehensive Grant	\$2,356,090	
Martin Marsala	University of California, San Diego	Induction of immune tolerance after spinal grafting of human ES-derived neural precursors	Transplantation Immunology	\$1,387,800	
					Total: \$61,054,748.00

CIRM Spinal Cord Injury Videos

 <p>CURED: Stem Cell Clinical Trial Stories</p>	 <p>Spinal Cord Injury and a CIRM-Funded Stem Cell-Based Trial</p>	 <p>Spinal Cord Injury and Stem Cell-Based Trials: What's the Latest?</p>	 <p>World's 1st Human Embryonic Stem Cell Trial for Spinal Cord Injury - Katie Sharify</p>
 <p>Roman Reed: What all patient advocates at the World Stem Cell Summit should know</p>	 <p>Bridges Trainee Meeting Keynote: Geron's Embryonic Stem Cell Trial for Spinal Cord Injury</p>	 <p>Progress and Promise in Spinal Cord Injury</p>	

Resources

- Blogs on Spinal Cord Injury Research from the Stem Cellar
- NIH: Spinal Cord Injury Information
- Find a clinical trial near you: NIH Clinical Trials database
- Spinal Cord Injury Association
- American Spinal Injury Association
- Christopher and Dana Reeve Foundation
- The Roman Reed Foundation
- Reeve-Irvine Research Center
- Family Caregiver Alliance
- National Family Caregivers Association

Find Out More:

Stem Cell FAQ | Stem Cell Videos | What We Fund

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